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EXAMINER

CHOI, WILLIAM C

ART UNIT PAPER NUMBER

2873

DATE MAILED: 03/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/052,396

Applicant(s)

PERRIN ET AL.

Examiner

William C. Choi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6, 9, 12-16, 18-20, 22 and 24-26 is/are rejected.
- 7) ☒ Claim(s) 5, 7, 8, 10, 11, 17, 21 and 23 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6 and 8.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

Receipt of the Information Disclosure Statements (IDS's) with the copies of the references cited therein, were received on 5/13/2002 and 7/1/2002. Initialized copies of the IDS's are enclosed with this office action.

Claim Objections

Claims 20 and 23 are objected to because of the following informalities: Specifically, in line 3 of claim 20, applicant discloses a second lens material for correcting chromatic "correction". Applicant is assumed to have desired to disclose "aberration" instead. Appropriate correction is required.

Specifically, in reference to line 2 of claim 23, the second instance of surface should be pluralized to read, "surfaces". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 6, 9, 18, 22 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Hashimoto et al (U.S. 5,289,312).

In regards to claim 1, Hashimoto et al discloses a catadioptric projection lens for projecting a pattern located on an object plane onto an image plane (column 1, lines 7-12, Figure 1), wherein, between the object plane and the image plane, the following are arranged in the given order: a first objective part (column 2, lines 54-57, Figure 1, "G1"), which creates a ray; a physical beam splitter with a beam splitter surface (column 2, lines 57-59, Figure 1, "2"), whereby the ray created by the first objective part is directed to the physical beam splitter (Figure 1, "G1" and "2a"); a mirror group (column 2, lines 61-64, Figure 1, "4") inherently having a high refractive power, this being reasonably assumed from Hashimoto et al disclosing the concave mirror being endowed with most of the refractive power of the entire system (column 3, lines 28-36). Hashimoto et al further discloses a concave mirror (Figure 1, "4") ; and a second objective part with positive refractive power (column 2, lines 65-68, Figure 1, "G3"), which creates an image of the pattern on the image plane (column 3, lines 1-2, Figure 1, "5"), wherein the system aperture is located imagewise behind the concave mirror (column 3, lines 2-4, Figure 1, "6").

Regarding claim 2, Hashimoto et al discloses wherein the system aperture is located between the beam splitter surface and the image plane (Figure 1, "6").

Regarding claim 3, Hashimoto et al discloses wherein the system aperture is located close to or on a rear exit surface of the beam splitter (Figure 1, "6").

Regarding claim 4, Hashimoto et al discloses wherein the refractive power of the mirror group is calculated such that a divergent beam incident on the mirror group is transformed into a convergent beam (Figure 1, "4", re light beam shape).

Regarding claim 6, Hashimoto et al discloses wherein the first objective part is designed for creating a divergent beam directed to the beam splitter (column 2, lines 54-57, Figure 1, re light beam).

Regarding claim 9, Hashimoto et al discloses wherein the refractive power of the mirror group is calculated such that the ray on the image side behind the mirror group is convergent (Figure 1, "4", re reflected light beam).

Regarding claim 18, Hashimoto et al discloses wherein the beam splitter surface is a polarizing beam splitter surface and a quarter wave plate is positioned between the beam splitter surface and the concave mirror (column 3, lines 21-25, Figure 1, "3").

Regarding claim 22, Hashimoto et al discloses wherein the projection lens is constructed such that the pattern is projected onto the image plane without creating an intermediate image (Figure 1).

In regards to claim 26, Hashimoto et al discloses a method for manufacturing semiconductor devices and other microdevices with the following steps: providing a mask with a given pattern (column 1, lines 41-49); illuminating the mask with ultraviolet light of a given wavelength (column 1, lines 50-66, Figure 3) and projecting an image of the pattern on a photosensitive substrate located in the area of the image plane of the

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projection lens (column 1, lines 60-66, Figure 3, "27") with the help of the catadioptric projection lens disclosed above in reference to claim 1.

Claims 1, 12, 13, 15, 16 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Oomura (U.S. 5,668,672).

In regards to claim 1, Oomura discloses a catadioptric projection lens for projecting a pattern located on an object plane onto an image plane (column 1, lines 8-17, Figure 3), wherein, between the object plane and the image plane, the following are arranged in the given order: a first objective part (column 2, lines 47-48, Figure 3, "G1"), which creates a ray; a physical beam splitter with a beam splitter surface (column 3, lines 43-47, Figure 3, "BS"), whereby the ray created by the first objective part is directed to the physical beam splitter (Figure 3, "G1" and "BS", re light ray); a mirror group (column 2, lines 65-67, Figure 3, "M") inherently having a high refractive power, this being reasonably assumed from Oomura disclosing it not being desirable for the refractive power of lens groups 1 and 2 to be too high so as to result in making the influence of that of the mirror small (column 4, lines 43-55). Oomura further discloses a concave mirror (Figure 3, "M") ; and a second objective part (column 2, lines 53-58, Figure 3, "G2"), which inherently will have a positive refractive power, this being reasonably assumed from the convergence of the light beam illustrated in Figure 3 and creates an image of the pattern on the image plane (column 2, lines 53-54, Figure 3, "P2"), wherein the system aperture is located imagewise behind the concave mirror (column 4, line 66 – column 5, line 1, Figure 3, "AS").

Regarding claim 12, Oomura discloses wherein no free-standing lens is placed between the beam splitter surface and the concave mirror (Figure 3, "M").

Regarding claim 13, Oomura discloses wherein the concave mirror has a positive magnification (column 2, lines 65-67).

Regarding claim 15, Oomura discloses wherein the second objective part is constructed in the manner of a retro focus objective, with at least one lens with negative refractive power between the beam splitter and the rear lenses (Figure 3, "L2a") inherently having a total positive refractive power, this being reasonably assumed from the Figure 3 illustrating a converging light ray through "G2"

Regarding claim 16, Oomura discloses wherein the beam splitter surface (Figure 3, "Bsa") is arranged in a beam splitter serving as a supporting body (Figure 3, "BS") and the system aperture is positioned outside of the beam splitter (Figure 3, "AS").

Regarding claim 20, Oomura discloses wherein the second objective part contains no correction means with a first lens material (column 6, lines 24-47 and column 11, Table 1-1, re SiO₂) and a second lens material of different dispersion for correcting chromatic aberration (column 6, lines 24-47 and column 11, Table 1-1, re CaF₂).

Claims 1, 14 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Furter (U.S. 5,742,436).

In regards to claim 1, Furter discloses a catadioptric projection lens for projecting a pattern located on an object plane onto an image plane (column 1, lines 6-8, Figure 1a), wherein, between the object plane and the image plane, the following are arranged

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in the given order: a first objective part (column 2, lines 18-20, Figure 1a, "100"), which creates a ray; a physical beam splitter with a beam splitter surface (column 2, lines 20-22, Figure 1a, "150"), whereby the ray created by the first objective part is directed to the physical beam splitter (Figure 1a, "100" and "150"); a mirror group (column 2, lines 21-22, Figure 1a, "19") inherently having a high refractive power, this being reasonably assumed from Furter disclosing it being undesirable to reduce the refractive power of the mirror element since it is required for adequate corrective effect (column 3, lines 48-54) and a concave mirror (Figure 1a, "19"); and a second objective part (Figure 1a, "400") inherently having a positive refractive power, this being reasonably assumed from the converging characteristics of the group, which creates an image of the pattern on the image plane (column 2, line 52, Figure 1a, "36"), wherein the system aperture is located imagewise behind the concave mirror (column 2, lines 48-49, Figure 1a, "40").

Regarding claim 14, Furter discloses wherein the first objective part contains a deviating mirror (Figure 1a, "5"), a first lens group between the object plane and the deviating mirror (Figure 1a, "100"), and a second lens group between the deviating mirror and the beam splitter (Figure 1a, "200").

Regarding claim 19, Furter discloses wherein all transparent optical components are made of the same material (column 2, lines 28-30).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hashimoto as applied to claim 1 above, and further in view of Omura (U.S. 6,081,382).

In regards to claim 24, Hashimoto discloses as set forth above but does not specifically disclose wherein at least one aspherical surface is positioned in the area of the system aperture and at least one aspherical surface being positioned in the area of at least one of the object plane and the image plane. Within the same field of endeavor, Omura teaches that it is desirable to have at least one aspherical surface being positioned in the area of the system aperture (column 9, Table 1A, lines 37-38, Figure 1, "L41") and at least one aspherical surface being positioned in the area of at least one of the object plane and the image plane (column 8, line 62, Figure 1, "L12") for the purpose of providing an improved catadioptric optical system (column 2, lines 31-38,). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the catadioptric lens of Hashimoto to have at least one aspherical surface being positioned in the area of the system aperture and at least one aspherical surface is positioned in the area of at least one of the object plane and the image plane since Omura teaches it being desirable to do so in order to provide an improved catadioptric optical system.

Allowable Subject Matter

Claims 5, 7, 8, 10, 11, 17, 21 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach a combination of all the claimed features as presented in claim 5: a catadioptric projection lens as claimed specifically wherein the refractive power of the mirror group is calculated such that the sum of the absolute values of the peripheral ray angles of beams incident on the mirror group and of beams exiting from the mirror group are much larger than zero.

The prior art fails to teach a combination of all the claimed features as presented in claim 7: a catadioptric projection lens as claimed specifically wherein the first objective part is designed such that an exiting divergent beam has a minimum peripheral ray angle of more than 20% of the image side numerical aperture of the projection lens.

The prior art fails to teach a combination of all the claimed features as presented in claim 8: a catadioptric projection lens as claimed specifically wherein the first objective part in front of the beam splitter has a negative refractive power adapted to create a waist section in the ray trajectory.

The prior art fails to teach a combination of all the claimed features as presented in claim 10: a catadioptric projection lens as claimed specifically wherein the beam

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exiting on the image side of the mirror group has a peripheral ray angle of more than 10% of the image side numerical aperture.

The prior art fails to teach a combination of all the claimed features as presented in claim 11: a catadioptric projection lens as claimed specifically wherein the absolute value of the peripheral ray angle of the rays arriving at the mirror group is larger than the absolute value of the peripheral ray angle of the rays emitted from the mirror group.

The prior art fails to teach a combination of all the claimed features as presented in claim 13: a catadioptric projection lens as claimed specifically

The prior art fails to teach a combination of all the claimed features as presented in claim 17: a catadioptric projection lens as claimed specifically wherein the beam splitter surface is positioned in a beam splitter block that has an optical minimal shape other than cubic shape, and wherein the maximum radiated material volume is more than 70% of the outer volume of the beam splitter block.

The prior art fails to teach a combination of all the claimed features as presented in claim 21: a catadioptric projection lens as claimed specifically wherein the image side numerical aperture is more than approx. 0.7.

The prior art fails to teach a combination of all the claimed features as presented in claim 23: a catadioptric projection lens as claimed specifically wherein the sine of the maximum beam angle at a refracting or reflecting surface for all surface, with the exception of a maximum of three most imagewise surfaces, is less than 80% or 70% of the image side numerical aperture.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William C. Choi whose telephone number is (703) 305-3100. The examiner can normally be reached on Monday-Friday from about 9:00 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached on (703) 308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3431 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

W.C.

William Choi
Patent Examiner
Art Unit 2873
February 24, 2003


Georgia Epps
Supervisory Patent Examiner
Technology Center 2800